EXHIBIT H

OMNIBUS BROWN DECLARATION

UNDERSTANDING AND USING ADVANCED STATISTICS

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can be done in a number of ways including transforming the scores, using a more stringent significance level (perhaps 0.01 rather than 0.05), applying a non-parametric procedure.

Statistical significance

Probability testing is at the centre of statistical analysis and is essentially concerned with deciding how probable it is that the results observed could have been due to chance or error variation in the scores. To make the explanation simpler, we shall take the case of testing to see whether there is a difference between two groups of respondents. Suppose we have measured the amount of concern people have with their body image using a questionnaire in which a high score indicates a high level of concern, and done this for a group of women and for a group of men. The null hypothesis states that there is no difference between the scores of the two groups. The research (or alternative) hypothesis states that there is a difference between the scores of the two groups. The research hypothesis may predict the direction of the outcome (e.g. women will have a higher score than the men) in which case it is a directional or one-tailed hypothesis. Or the research hypothesis may just predict a difference between the two groups, without specifying which direction that difference will take (e.g. women and men will score differently from one another) in which case it is referred to as a non-directional or two-tailed hypothesis.

In our example, we want to know how likely it is that the difference in the mean scores of the women and men was the result of chance variation in the scores. You will probably recognise this as a situation in which you would turn to the *t*-test, and may remember that in the *t*-test you calculate the difference between the means of the two groups and express it as a ratio of the standard error of the difference which is calculated from the variance in the scores. If this ratio is greater than a certain amount, which you can find from the table for *t*, you can conclude that the difference between the means is unlikely to have arisen from the chance variability in the data and that there is a 'significant' difference between the means.

It is conventional to accept that 'unlikely' means having a 5% (0.05) probability or less. So if the probability of the difference arising by chance is 0.05 or less, you conclude it did not arise by chance. There are occasions when one uses a more stringent probability or significance level and only accepts the difference as significant if the probability of its arising by chance is 1% (0.01) or less. Much more rarely, one may accept a less stringent probability level such as 10% (0.1).

In considering the level of significance which you are going to use, there are two types of errors which need to be borne in mind. A Type I error occurs when a researcher accepts the research hypothesis and incorrectly rejects the null hypothesis. A Type II error occurs when the null hypothesis is accepted and the research

hypothesis is incorrectly rejected. When you use the 5% (0.05) significance level, you have a 5% chance of making a Type I error. You can reduce this by using a more stringent level such as 1% (0.01), but this increases the probability of making a Type II error.

When a number of significance tests are applied to a set of data it is generally considered necessary to apply some method of correcting for multiple testing. (If you carried out 100 *t*-tests, 5% of them are expected to come out 'significant' just by chance. So multiple significance testing can lead to accepting outcomes as significant when they are not, a Type I error.) To prevent the occurrence of a Type I error some researchers simply set the significance level needed to be reached at the 1% level, but this does seem rather arbitrary. A more precise correction for multiple testing is the Bonferroni correction in which the 0.05 probability level is divided by the number of times the same test is being used on the data set. For example, if four *t*-tests are being calculated on the same data set then 0.05 would be divided by 4 which would give a probability level of 0.0125 which would have to be met to achieve statistical significance.

RECAPITULATION OF ANALYSIS OF VARIANCE (ANOVA)

ANOVAs, like *t*-tests, examine the differences between group means. However, an ANOVA has greater flexibility than a *t*-test since the researcher is able to use more than two groups in the analysis. Additionally ANOVAs are able to consider the effect of more than one independent variable and to reveal whether the effect of one of them is influenced by the other: whether they interact.

Variance summarises the degree to which each score differs from the mean, and as implied by the name ANOVAs consider the amount of variance in a data set. Variance potentially arises from three sources: individual differences, error and the effect of the independent variable. The sources of variance in a set of data are expressed in the sum of squares value in an ANOVA. In a between-groups analysis of variance, the between-groups sum of squares represents the amount of variance accounted for by the effect of the independent variable with the estimate of error removed. The sums of squares are divided by the corresponding degrees of freedom to produce the mean square between groups and the mean square within groups. The ratio between these two figures produces a value for F. The further away from one the F value is, the lower the probability that the differences between the groups arose by chance and the higher the level of significance of the effect of the independent variable.

Repeated measures ANOVAs occur when the participants complete the same set of tasks under different conditions or in longitudinal studies where the same tasks are completed by the same participants on more than one occasion. There are additional requirements which need to be met in order to ensure that the